
पक्की मिट्टी की चपटी टैरेस टाइलें —
विशिष्टि
भाग 2 हस्तनिर्मित
(तीसरा पुनरीक्षण)

Burnt Clay Flat Terracing Tiles —
Specification
Part 2 Hand Made
(Third Revision)

ICS 91.100.25

© BIS 2023



भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
मानक भवन, 9 बहादुर शाह ज़फ़र मार्ग, नई दिल्ली - 110002
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI - 110002

www.bis.gov.in www.standardsbis.in

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Clay and Stabilized Soil Products for Construction Sectional Committee had been approved by the Civil Engineering Division Council.

Burnt clay flat terracing tiles, which may be hand-made or machine pressed, are used for flat roof finishing over lime concrete or cement concrete base, and depending on the degree of protection necessary, they are used in two or more courses. This standard was first published in 1964 and subsequently revised in 1975 and in 1992.

The present revision has been taken up to incorporate the improvement found necessary in the light of usage of this standard and the suggestions made by various bodies implementing it.

The standard is bifurcated into two parts. The other part being:

Part 1 Machine made

The main modifications incorporated in this revision are as follows:

- a) The provision to incorporate agro residues/industrial by-products in the raw material for tiles has been added.
- b) The requirement of water absorption and flexural strength of the tiles have been modified.
- c) The reporting of the test results have been modified and the accuracy defined.
- d) The required loading for determining flexural strength has been modified.
- e) The formula for flexural strength has been modified for uniformity and to reflect the standard units.
- f) The diagram for setup of testing of flexural strength has been modified to increase clarity.

In the formulation of this standard due weightage has been given to international co-ordination among the standards and practices prevailing in different countries in addition to relating it to the practices in the field in this country.

The composition of the Committee responsible for the formulation of this standard is listed in Annex B.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 'Rules for rounding off numerical values (*second revision*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

BURNT CLAY FLAT TERRACING TILES — SPECIFICATION

PART 2 HAND MADE

(Third Revision)

1 SCOPE

This standard (Part 2) lays down the requirements for hand-made burnt clay flat terracing tiles.

2 REFERENCES

The standards listed below contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed below:

<i>IS No.</i>	<i>Title</i>
IS 2248 : 1992	Glossary of terms relating to structural clay products (<i>second revision</i>)
IS 3495 (Part 2) : 2019	Method of tests of clay building bricks: Part 2 Determination of water absorption (<i>fourth revision</i>)
IS 5454 : 1978	Methods for sampling of clay building bricks (<i>first revision</i>)

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 2248 shall apply.

4 GENERAL QUALITY

The terracing tile shall be made from suitable soil of even texture and shall be uniformly well burnt. They shall be uniform in shape and size and shall be free from irregularities, such as twists, bends, cracks and particles of stones.

Note — The clay may be blended with industrial by-products and/or agro-residues while ensuring that the final product conforms to the requirements of this standard.

5 DIMENSIONS, SHAPE, TOLERANCES AND WARPAGE

5.1 The size of terracing tiles and the tolerances shall be as given in 5.1.1 to 5.1.4.

5.1.1 Length — 150 mm to 250 mm in the stages of 25 mm.

5.1.2 Width — 75 mm to 200 mm in the stages of 25 mm.

5.1.3 Thickness — 25 mm to 50 mm in the stages of 5 mm.

5.1.4 Tolerances — The tolerances in length, width and thickness shall be ± 3 percent.

5.2 Warpage

5.2.1 The maximum warpage for the tiles measured as described in 5.2.2 shall not exceed 2 percent of the dimensions in any direction.

5.2.2 Place a straight-edge flat over the tile resting on a plane surface so as to leave maximum gap between the straight-edge and the surface of the tile. Judging by the naked eye, insert the measuring metallic wedge in the gap and measure the maximum value of gap.

6 WATER ABSORPTION

The average water absorption by weight when tested according to the method described in IS 3495 (Part 2) shall not exceed 20 percent. The individual values shall not exceed 23 percent.

7 FLEXURAL STRENGTH

The average modulus of rupture in bending when tested by the method described in Annex A shall not be less than 1.5 N/mm². The individual values shall not be less than 1.2 N/mm².

8 SAMPLING

Sampling and the criteria for determining the suitability of the tiles shall be as given in IS 5454.

9 MARKING

9.1 Each terracing tile shall be legibly and indelibly marked with the identification of the manufacturer or his trade-mark, if any; the marking shall not cover more than five percent of the area of the specimen. Each tile shall also be marked by symbol 'H' to indicate hand-made tile.

9.1.1 Each terracing tile may also be marked with the Standard Mark.

9.1.1.1 The terracing tiles conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act, 2016* and the Rules and Regulations framed thereunder, and the terracing tiles may be marked with the Standard Mark.

ANNEX A
(Clause 7)

DETERMINATION OF FLEXURAL STRENGTH

A-1 TEST SPECIMENS

Tiles shall be used for this test from the sample selected in the manner described in 8.

A-2 APPARATUS

A-2.1 The apparatus (see Fig. 1) shall consist of two parallel self-aligning cylindrical steel bearers, with the bearing surface rounded to 40 mm diameter, and so placed that the distance between the centres could be altered. The load shall be applied through a third steel bearer of similar shape placed midway between the parallel to the supports. The length of all the bearers shall exceed the maximum width of the tile under test for square and rectangular tiles.

A-2.1.1 The loading device may consist of a bucket connected either directly or through levers to the loading arm. The loading shall be at a uniform rate of 7.5 to 9 N/s. Provision shall be made to arrest the flow of lead shots immediately as the tile breaks.

A-2.2 Alternatively, a suitably modified hand operated compression testing machine with a minimum load frame capacity of 10 tons may be used (see Fig. 2). In this system the bearer assembly is mounted on a rigid mild steel plate and the third central loading bearing is fixed through a suitable dial micrometer having (least count 0.25 mm) or an equally sensitive device to bear on the loading member or on the specimen at mid span. The specimen is supported on the bottom parallel bearers separated by a distance of minimum three-fourths (3/4) of the length of the tile.

A-2.2.1 The error in the load reading shall not exceed 2.2 N for loads up to 220 N and for greater loads, the error shall not exceed 1 percent of the maximum load. The rate of loading shall be uniform and shall vary in the range of 7.5 to 9 N/s.

A-3 PROCEDURE

A-3.1 Test the tiles as described in **A-3.1.1** and **A-3.1.2**.

A-3.1.1 Soak the tiles in water at a temperature of $27 \pm 3^\circ\text{C}$ for 24 h.

A-3.1.2 Support the tile evenly flat-wise on the bearer set, with a span equal to three-fourths the dimensions of the tile and resting on the natural bottom surface. Rectangular tiles shall be supported along longer face. To ensure uniform distribution of load at supports, provide suitable packing between the tile and the bearers. Apply the load with the direction of the load perpendicular to the span at a uniform rate of 7.5 to 9.0 N/s.

A-4 CALCULATION AND REPORT OF TEST RESULTS

A-4.1 The flexural strength shall be calculated for each individual tile by the following formula:

$$F = \frac{3Pl}{2BD^2}$$

where

F = flexural strength of the tile, in N/mm^2 ;

P = load, in N;

l = span, in mm;

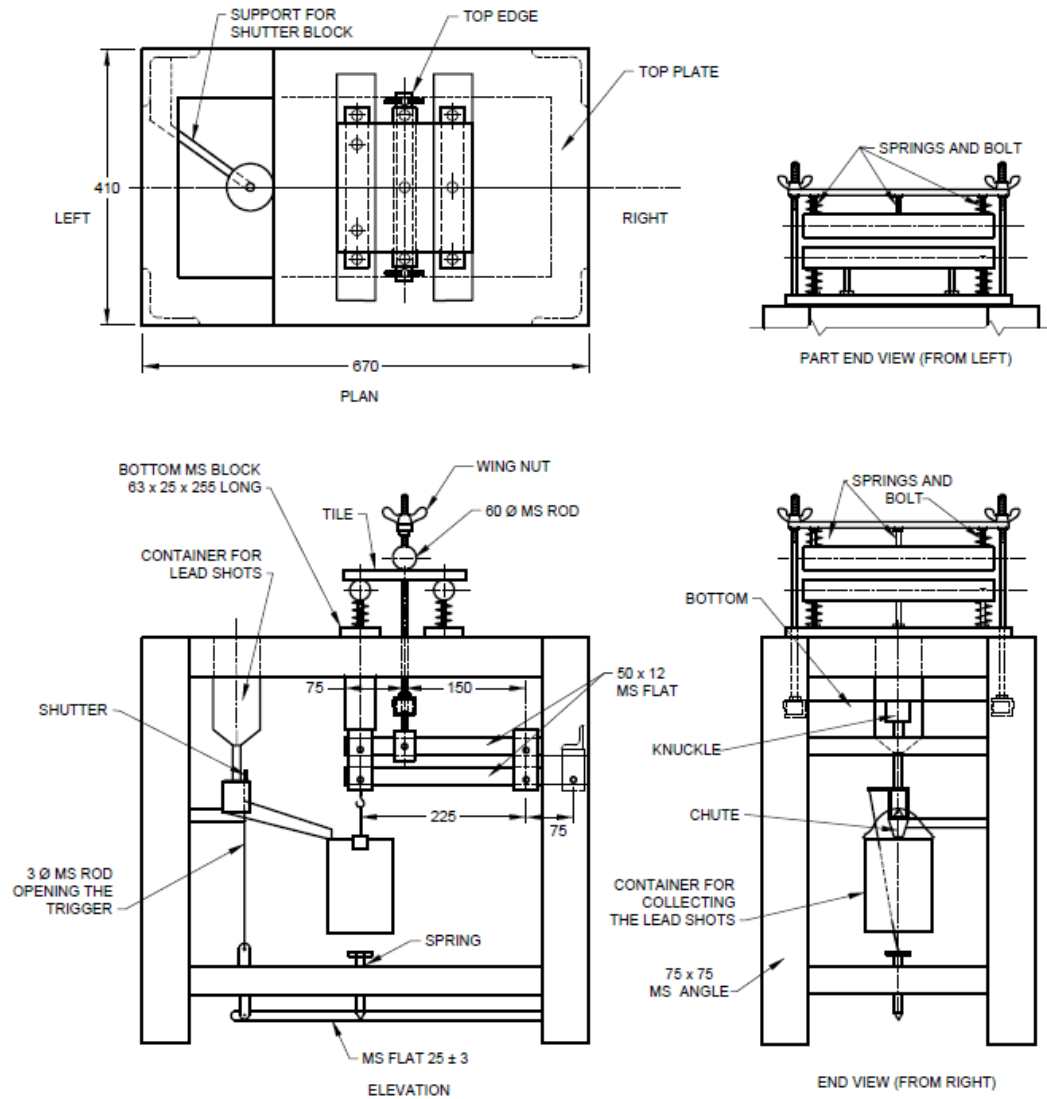
B = width of the tile, in mm; and

D = depth of the tile, in mm.

NOTE — While using the setup as per Fig. 1, P shall be taken as the product of mass of lead shots and lever arm.

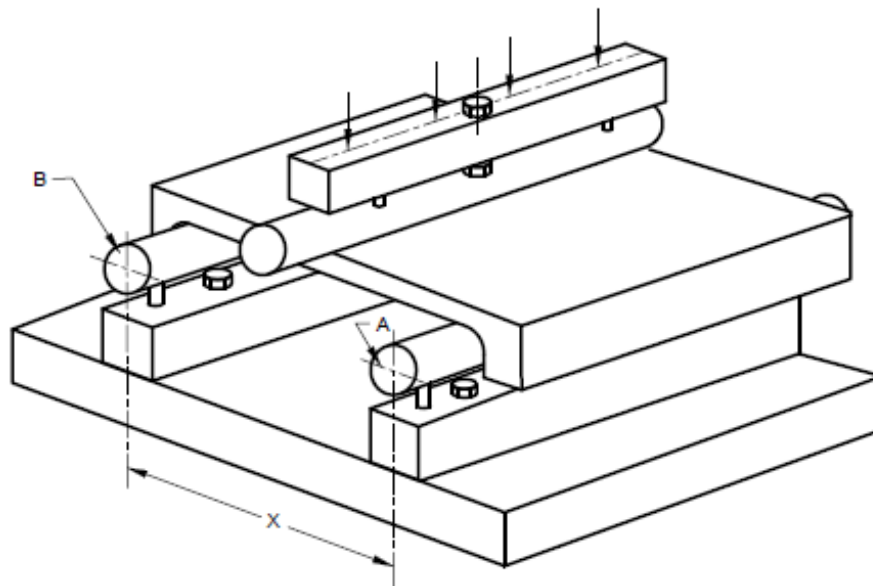
A-4.2 The average value shall be calculated to the nearest one decimal place.

All the individual results as well as the average may be reported.

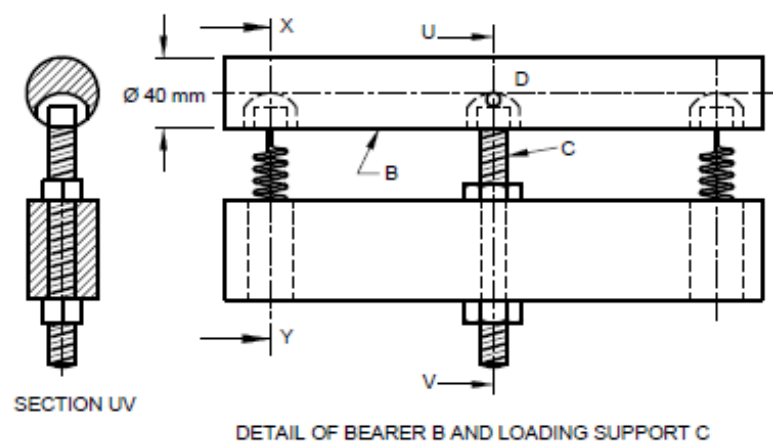
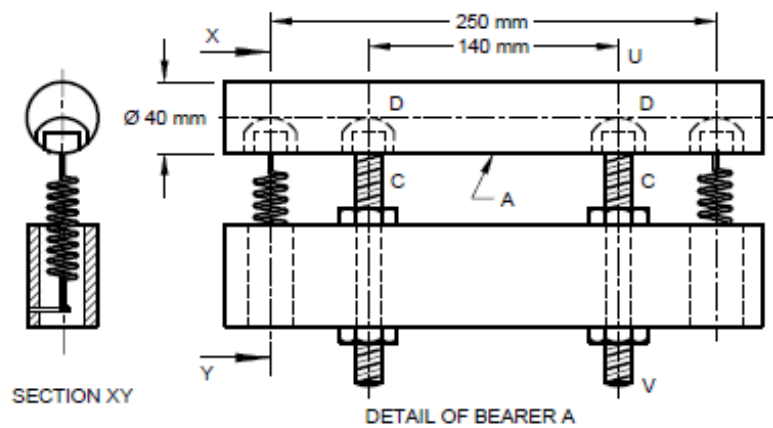


All dimensions in millimetres

FIG.1 TILE TESTING MACHINE (FOR THE DETERMINATION OF FLEXURAL STRENGTH ROOFING TILE)



X = SPAN AS PER TILE SIZE



All dimensions in millimetres

FIG. 2 ESSENTIAL OF APPARATUS FOR TRANSVERSE TEST

ANNEX B
(Foreword)

COMMITTEE COMPOSITION

Clay and Stabilized Soil products for Construction Sectional committee, CED 30

<i>Organization</i>	<i>Representative(s)</i>
Indian Institute of Science, Bengaluru	DR B. V. VENKATARAMA REDDY (Chairperson)
Auroville Earth Institute, Villupuram	SHRI SATPREM MAINI
Building Materials & Technology Promotion Council, New Delhi	SHRI SHARAD GUPTA SHRI D. P. SINGH (<i>Alternate</i>)
Central Pollution Control Board, New Delhi	SHRI B. VINOD BABU
Central Public Works Department, New Delhi	CHIEF ENGINEER (CSQ) SHRI DIWAKAR AGARWAL (<i>Alternate</i>)
Central Soil and Materials Research Station, New Delhi	SHRI U. S. VIDYARTHI SHRI B. K. MUNZNI (<i>Alternate</i>)
CSIR-Advanced Materials & Processes Research Institute, Bhopal	DR R. K. MORCHHALE DR MANISH MUDGAL (<i>Alternate</i>)
CSIR-Central Building Research Institute, Roorkee	SHRIMATI HINA GUPTA MOHAMMAD REYAZUR RAHMAN (<i>Alternate</i>)
CSIR-Central Glass & Ceramic Research Institute, Kolkata	DR PARVESH AGARWAL SHRIMATI ASHAL T. ANIL (<i>Alternate</i>)
CSIR-North-East Institute of Science and Technology, Jorhat	DR PINAKI SENGUPTA
CSIR-Structural Engineering Research Centre, Chennai	DR P. S. AMBILY DR K. SENTHIL KUMAR (<i>Alternate</i>)
Delhi Development Authority, New Delhi	CHIEF ENGINEER (DESIGN) SUPERINTENDING ENGINEER (<i>Alternate</i>)
Development Alternatives, New Delhi	DR SOUMEN MAITY SHRI P. S. HALDAR (<i>Alternate</i>)
Greentech Knowledge Solution, New Delhi	DR SAMEER MAITHEL SHRI SONAL KUMAR (<i>Alternate</i>)
Gujarat Engineering Research Institute, Vadodara	SHRI A.M. BARVE SHRI SANJAY SHRIVASTAV (<i>Alternate</i>)
Indian Institute of Technology Kanpur, Kanpur	DR SYAM NAIR DR RAJESH SATHIYAMOORTHY (<i>Alternate</i>)
Military Engineer Services, Engineer-in-Chief's Branch, Integrated HQ of MoD (Army), New Delhi	SHRI KULBHUSHAN JAIN SHRI TALVINDER KAUR (<i>Alternate</i>)
Ministry of Science & Technology, New Delhi	DR RAJKUMAR JOSHI SHRI PAWAN KUMAR (<i>Alternate</i>)

<i>Organization</i>	<i>Representative(s)</i>
National Institute of Engineering, Mysore	DR GOURAV K.
National Test House, Kolkata	SHRI D. V. S. PRASAD SHRI NARESH GUPTA (<i>Alternate</i>)
NBCC (India) Limited, New Delhi	SHRI ANIL MALLA SHRI M. K. CHAWLA (<i>Alternate</i>)
NTPC Ltd, Noida	SHRI JITENDRA KUMAR SHRI MOHIT JHALANI (<i>Alternate</i>)
Public Works Department, Govt of Tamil Nadu, Chennai	SUPERINTENDING ENGINEER EXECUTIVE ENGINEER (<i>Alternate</i>)
Punjab State Council for Science and Technology, Chandigarh	SHRI PRITPAL SINGH SHRI MAGANBIR SINGH (<i>Alternate</i>)
Shriram Institute of Industrial Research, New Delhi	DR MUKESH GARG SHRI RABINDRA KUMAR JENA (<i>Alternate</i>)
The Energy and Resources Institute (TERI), New Delhi	SHRI SACHIN KUMAR
Unique Engineering Testing & Advisory Services, Surat	SHRI HITESH DESAI SHRI NEHAL H. DESAI (<i>Alternate</i>)
Wienerberger India Private Ltd, Bengaluru	SHRI KUNDAN B. DIGHE SHRI DEVIDAS RAO (<i>Alternate</i>)
In Personal Capacity (<i>Roorkee</i>)	DR J. M. BHATNAGAR
BIS Directorate General	SHRI ARUN KUMAR S., SCIENTIST 'E'/DIRECTOR AND HEAD (CIVIL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (<i>Ex-officio</i>)]

Member Secretary
SHRIMATI DIVYA S.
SCIENTIST 'D'/DEPUTY DIRECTOR
(CIVIL ENGINEERING), BIS

Bureau of Indian Standards

BIS is a statutory institution established under the *Bureau of Indian Standards Act, 2016* to promote harmonious development of the activities of standardization, marking and quality certification of goods and attending to connected matters in the country.

Copyright

BIS has the copyright of all its publications. No part of these publications may be reproduced in any form without the prior permission in writing of BIS. This does not preclude the free use, in the course of implementing the standard, of necessary details, such as symbols and sizes, type or grade designations. Enquiries relating to copyright be addressed to the Head (Publication & Sales), BIS.

Review of Indian Standards

Amendments are issued to standards as the need arises on the basis of comments. Standards are also reviewed periodically; a standard along with amendments is reaffirmed when such review indicates that no changes are needed; if the review indicates that changes are needed, it is taken up for revision. Users of Indian Standards should ascertain that they are in possession of the latest amendments or edition by referring to the website- www.bis.gov.in or www.standardsbis.in.

This Indian Standard has been developed from Doc No.: CED 30 (18579).

Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

BUREAU OF INDIAN STANDARDS

Headquarters:

Manak Bhavan, 9 Bahadur Shah Zafar Marg, New Delhi 110002

Telephones: 2323 0131, 2323 3375, 2323 9402

Website: www.bis.gov.in

Regional Offices:

	Telephones
Central : 601/A, Konnectus Tower -1, 6 th Floor, DMRC Building, Bhavbhuti Marg, New Delhi 110002	{ 2323 7617
Eastern : 8 th Floor, Plot No 7/7 & 7/8, CP Block, Sector V, Salt Lake, Kolkata, West Bengal 700091	{ 2367 0012 2320 9474
Northern : Plot No. 4-A, Sector 27-B, Madhya Marg, Chandigarh 160019	{ 265 9930
Southern : C.I.T. Campus, IV Cross Road, Taramani, Chennai 600113	{ 2254 1442 2254 1216
Western : Plot No. E-9, Road No.-8, MIDC, Andheri (East), Mumbai 400093	{ 2821 8093

Branches : AHMEDABAD. BENGALURU. BHOPAL. BHUBANESHWAR. CHANDIGARH. CHENNAI. COIMBATORE. DEHRADUN. DELHI. FARIDABAD. GHAZIABAD. GUWAHATI. HIMACHAL PRADESH. HUBLI. HYDERABAD. JAIPUR. JAMMU & KASHMIR. JAMSHEDPUR. KOCHI. KOLKATA. LUCKNOW. MADURAI. MUMBAI. NAGPUR. NOIDA. PANIPAT. PATNA. PUNE. RAIPUR. RAJKOT. SURAT. VISAKHAPATNAM.